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EXAMINER
SINGH, DALZID E

ART UNIT	PAPER NUMBER
2613	

DATE MAILED: 06/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/084,057	CHO ET AL.	
	Examiner	Art Unit	
	Dalzid Singh	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 May 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *73-83,85-94,105 and 106* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *73-83,85-94,105 and 106* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "pulse modulator having a bias and the drive voltage to form optical pulses selected to achieve maximal spectral efficiency of PSK transmission..." must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 73-83, 85-94, 105 and 106 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 73 recite, "the bias and the drive voltage of the pulse modulator are selected according to the characteristics of laser optical power, network channel spacing, the transmission line length, the transmission line dispersion, and non-linearities of the transmission network..." There is no structure of circuit diagram provides to teach a person of ordinary skill in the art how the bias and the drive voltage of the pulse modulator are selected according to the characteristics. Therefore, the specification fails to provide enabling disclosure for claim 73.

Claim 85, recites, "the optical pulse shape selected according to the characteristics of laser optical power, network channel spacing, the transmission line length, the transmission line dispersion, and non-linearities of the transmission network..." There is no structure of circuit diagram provides to teach a person of ordinary skill in the art how the optical pulse shape is selected according to the

characteristics. Therefore, the specification fails to provide enabling disclosure for claim 73.

Claim 89 recites "modulating an amplitude is performed after combining the PSK optical data stream of the WDM channels" As shown in Fig. 9, the pulse modulator which provide amplitude modulating effect to the optical signal is provided before the WDM combiner. There is no structure of circuit diagram provided to show that the pulse modulator is provided after combining the PSK optical data stream. Therefore, the specification fails to provide enabling disclosure for claim 89.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 73-83 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 73 recites "pulse modulator… data modulator… and WDM combiner…" It is unclear how the various elements are connected together.

Claim 73, recites " optical fiber having embedded therein optical signal comprising return-to-zero phase-shift-keyed optical signal" It is unclear which element provides RZ optical signal and which element generates the RZ-PSK optical signals. Furthermore, it is unclear if the "optical fiber" is the same as the "PSK transmission line".

Claim 73 recites the limitation "the PSK transmission line" in line 10. There is insufficient antecedent basis for this limitation in the claim.

Claim 73 recites the limitation "the data" in line 16. There is insufficient antecedent basis for this limitation in the claim.

Claim 85 recites, "transmitting the RZ-PSKWDM optical signal along an optical fiber..." It is unclear which element provides RZ optical signal and which element generates the RZ-PSKWDM optical signals.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 73, 74, 79, 85-90 and 105 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US Pub. No. 2003/0090768) in view of Satoh (US Patent No. 6,583,910).

Regarding claim 73 (as far as understood), Liu et al disclose optical communication system for carrying optical signals, comprising:

at least one optical fiber having embedded therein an optical signal comprising return-to-zero phase shift key (PSK) optical pulses (as shown in Fig. 1, Liu et al show optical fiber (151) for carrying return-to-zero PSK optical signal; see paragraph [0005]);

at least one laser (101) to generate a cw optical signal;

at least one electro-optical data modulator (121) to encode the data for transmission in the fiber optic network; and

a WDM combiner (161) to combine multiple optical signals corresponding to multiple channels with arbitrary polarization states selected from at least one of linear, circular, or elliptical (Fig. 1 shows that the optical channels have certain polarization states therefore it is considered that the optical channels have arbitrary polarization states).

Liu et al differ from the claimed invention in that Liu et al do not specifically disclose that bias and drive voltage of the pulse modulator is selected according to transmission characteristic. Satoh is cited to show optical transmitter comprising of optical modulator wherein the bias and drive voltage of the modulator is selected based on the transmission characteristics (such as Q-factor) (see col. 6, lines 56-65). Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to adjust or set the bias and drive voltage of the optical modulator according to the transmission characteristics. One of ordinary skill in the art would have been motivated to do such in order to generate optimum pulse shape which reduces distortion.

Regarding claims 74 and 86, as discussed above, Liu et al disclose optical transmission system transmitting RZ optical signal formed by pulse modulator with optical pulses having bell-like shapes (see Fig. 2B).

Regarding claim 79, as shown in Fig. 1, Liu et al show that the optical fiber is a non-zero-dispersion shifted fiber (as shown in Fig. 1, Liu et al show that the fiber comprises dispersion-managed link; in paragraph [0021] Liu et al disclose that the dispersion is not fully compensated, which indicates that the dispersion is not zero).

Regarding claim 85, Liu et al disclose a method for optically transmitting data, comprising:

preparing a plurality of phase shift keyed (PSK) optical data streams, each PSK optical data stream having a different wavelength and encoding data from at least one respective data source (see Fig. 1 and paragraph [0005]);

combining the PSK optical data streams to prepare a wavelength division multiplexed (WDM) optical signal (see paragraph [0007]; Fig. 1 shows that the optical channels have certain polarization states therefore it is considered that the optical channels have arbitrary polarization states); and,

transmitting the PSK optical signal along an optical fiber of an optical fiber network (as shown in Fig. 1, the PSK signals are wavelength division multiplexed and transmitted to the fiber (151)).

Liu et al differ from the claimed invention in that Liu et al do not specifically disclose that bias and drive voltage of the pulse modulator is selected according to transmission characteristic. Satoh is cited to show optical transmitter comprising of optical modulator wherein the bias and drive voltage of the modulator is selected based on the transmission characteristics (such as Q-factor) (see col. 6, lines 56-65). Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to adjust or set the bias and drive voltage of the optical modulator according to the transmission characteristics. One of ordinary skill in the art would have been motivated to do such in order to generate optimum pulse shape which reduces distortion.

Regarding claims 88 and 106, Liu et al disclose that each PSK optical data stream is a quaternary phase shift keyed optical data stream (see paragraph [0039]; Liu et al disclose that the data could also be combined with QPSK) and shown in Fig. 5, Liu et al show encoding data using two modulators driven from a respective pair of data sources.

Regarding claim 89 (as far as understood), as discussed above, modulating amplitude is performed after combining the PSK optical data streams (the modulator could be placed after WDM (161) of Liu et al).

Regarding claim 90, as shown in Fig. 1, Liu et al show plurality of PSK optical data streams comprises modulating a phase of light provided by a cw light source.

Regarding claim 105, as discussed above, shown in Fig. 1, Liu et al show optical modulator driven from a single respective data source.

8. Claim 87 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US Pub. No. 2003/0090768) in view of Satoh (US Patent No. 6,583,910) and further in view of Bergano et al (US Pub. No. 2004/0161245).

Regarding claim 87, as discussed above, the combination of Liu et al and Satoh discloses each PSK optical data stream is a binary phase shift keyed BPSK optical data stream encoding data (the data stream is in binary form such as 0's and 1's; see paragraph [0019];) and differs from the claimed invention in that the combination does not disclose phase shift keyed BPSK optical data stream encoding data using Mach-Zehnder modulator driven from a single respective data source. Bergano teaches PSK

data modulator may include Mach-Zehnder. Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide Mach-Zehnder modulator to modulate the data signal. One of ordinary skill in the art would have been motivated to do such in order to provide increase performance of the optical signal for long haul communication.

9. Claim 75-78 and 80-82 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US Pub. No. 2003/0090768) in view of Satoh (US Patent No. 6,583,910) further in view of Sarchi et al (US Patent No. 6,577,800).

Regarding claim 75, as discussed above, the combination of Liu et al and Satoh discloses transmission system comprising of optical fiber (151), as shown in Fig. 1, comprising of dispersion managed link. Liu et al differ from the claimed invention in that Liu et al do not specifically disclose the optical fiber has a zero dispersion wavelength of less than about 1500 nanometers. However, it is well known that there are various types of dispersion fiber which provide zero dispersion for a specific range of wavelength. Sarchi et al is cited to show such well known concept. In col. 9, lines 61-67 to col. 10, lines 1-19, Sarchi et al disclose various wavelengths operating around 1550 nanometer to provide zero dispersion. Therefore, it would have been obvious to an artisan of ordinary skill at the time the invention was made to provide zero dispersion for such wavelength. One of ordinary skill in the art would have been motivated to do such in order to reduce crosstalk.

Regarding claim 76, as discussed above, Sarchi et al disclose that the optical signal has a wavelength of between about 1500 nanometers and about 1625 nanometers (see col. 9, lines 61-67 to col. 10, lines 1-19).

Regarding claim 77, as discussed above, the combination of Liu et al and Satoh discloses transmission system comprising of optical fiber (151), as shown in Fig. 1, comprising of dispersion managed link. The combination differs from the claimed invention in that the combination does not specifically disclose the dispersion of the optical fiber is at least about 2 picoseconds per nanometer per kilometer at a wavelength of the optical signal. However, it is well known that there are various types of dispersion fiber which provide dispersion compensation. Sarchi et al is cited to show such well known concept. In col. 12, lines 1-36, Sarchi et al disclose various dispersion compensation optical fibers. Therefore, it would have been obvious to an artisan of ordinary skill at the time the invention was made to provide such dispersion for optical fiber. One of ordinary skill in the art would have been motivated to do such in order to compensate for accumulated dispersion along the transmission line.

Regarding claim 78, as discussed above, the combination of Liu et al and Satoh discloses transmission system comprising of optical fiber (151), as shown in Fig. 1 of Liu et al, comprising of dispersion managed link. The combination differs from the claimed invention in that the combination does not specifically disclose the dispersion of the optical fiber is less than about 2 picoseconds per nanometer per kilometer at a wavelength of the optical signal. However, it is well known that there are various types of dispersion fiber which provide dispersion compensation. Sarchi et al is cited to show

such well known concept. In col. 12, lines 1-36, Sarchi et al disclose various dispersion of optical fiber. Therefore, it would have been obvious to an artisan of ordinary skill at the time the invention was made to provide such dispersion optical fiber. One of ordinary skill in the art would have been motivated to do such in order to compensate for accumulated dispersion along the transmission line.

Regarding claim 80, as discussed above, the combination of Liu et al and Satoh discloses transmission system comprising of optical fiber (151), as shown in Fig. 1, comprising of dispersion managed link. The combination differs from the claimed invention in that the combination does not specifically disclose the dispersion of the optical fiber is less than about 15 picoseconds per nanometer per kilometer at a wavelength of the optical signal. However, it is well known that there are various types of dispersion fiber which provide dispersion compensation. Sarchi et al is cited to show such well known concept. In col. 12, lines 1-36, Sarchi et al disclose various dispersion optical fibers. Therefore, it would have been obvious to an artisan of ordinary skill at the time the invention was made to provide such dispersion optical fiber. One of ordinary skill in the art would have been motivated to do such in order to compensate for accumulated dispersion along the transmission line.

Regarding claim 81, as discussed above, the combination of Liu et al and Satoh discloses transmission system comprising of optical fiber (151), as shown in Fig. 1, comprising of dispersion managed link. The combination differs from the claimed invention in that the combination does not specifically disclose the dispersion of the optical fiber is less than about -15 picoseconds per nanometer per kilometer at a

wavelength of the optical signal. However, it is well known that there are various types of dispersion fiber which provide dispersion compensation. Sarchi et al is cited to show such well known concept. In col. 12, lines 1-36, Sarchi et al disclose various dispersion of optical fiber. Therefore, it would have been obvious to an artisan of ordinary skill at the time the invention was made to provide such dispersion optical fiber. One of ordinary skill in the art would have been motivated to do such in order to compensate for accumulated dispersion along the transmission line.

Regarding claim 82, as discussed above, the combination of Liu et al and Satoh discloses transmission system comprising of optical fiber (151), as shown in Fig. 1, comprising of dispersion managed link. The combination differs from the claimed invention in that the combination does not specifically disclose the optical fiber has a zero dispersion wavelength of less than about 1310 nanometers. However, it is well known that there are various types of dispersion fiber which provide zero dispersion for a specific range of wavelength. Sarchi et al is cited to show such well known concept. In col. 9, lines 61-67 to col. 10, lines 1-19, Sarchi et al disclose various wavelengths operating around 1550 nanometer to provide zero dispersion. Therefore, it would have been obvious to an artisan of ordinary skill at the time the invention was made to provide zero dispersion of such wavelength. One of ordinary skill in the art would have been motivated to do such in order to reduce crosstalk.

10. Claim 83 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US Pub. No. 2003/0090768) in view of Satoh (US Patent No. 6,583,910) and further in view of Taga et al (US Patent No. 5,872,647).

Regarding claim 83, the combination of Liu et al and Satoh discloses transmission of RZ-PSK optical signal comprising of phase modulator to modulate optical pulses and differs form the claimed invention in that the combination does not specifically disclose an extinction ratio between adjacent pulses of the optical signal that have a relative phase difference of essentially zero is at least about 3 dB and less than about 8 dB. However, it is well known that phase modulated optical have relative phase difference between adjacent pulses. Such difference can be measured by extinction ratio. Taga et al is cited to show such well known concept. In col. 4, lines 28-45, Taga et al teach extinction ratio between optical pulses to be between 3 dB and 10dB. Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide such extinction ratio. One of ordinary skill in the art would have been motivated to do such in order to reduce interchannel crosstalk.

11. Claims 91-94 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US Pub. No. 2003/0090768) in view of Satoh (US Patent No. 6,583,910) and further in view of Taga et al (US Patent No. 5,872,647).

Regarding claim 91, the combination of Liu et al and Satoh discloses transmission of RZ-PSK optical signal comprising of phase modulator to modulate optical pulses and differs form the claimed invention in that the combination does not

specifically disclose an extinction ratio between adjacent pulses of the optical signal that have a relative phase difference of essentially zero is at least about 3 dB and less than about 8 dB. However, it is well known that phase modulated optical have relative phase difference between adjacent pulses. Such difference can be measured by extinction ratio. Taga et al is cited to show such well known concept. In col. 4, lines 28-45, Taga et al teach extinction ratio between optical pulses to be between 3 dB and 10dB. Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide such extinction ratio. One of ordinary skill in the art would have been motivated to do such in order to reduce interchannel crosstalk.

Regarding claim 92, the combination of Liu et al, Satoh and Taga discloses that extinction ratio between adjacent pulses is 10 dB (see col. 4, lines 28-45 of Taga et al) and differs form the claimed invention in that the combination of the combination does not specifically disclose relative phase difference of at least about $\pi/2$. However, as discussed above, since the optical signal are phase modulated, therefore it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide phase difference between the optical pulses, such as $\pi/2$. One of rodinary skill in the art would have been motivated to do this in order to reduce noise or crosstalk.

Regarding claim 93, the combination of Liu et al and Satoh discloses transmission of RZ-PSK optical signal comprising of phase modulator to modulate optical pulses and differ form the claimed invention in that Liu et al do not specifically disclose an extinction ratio between adjacent pulses of the optical signal that have a

relative phase difference of essentially zero is at least about 5 dB and less than about 8 dB. However, it is well known that phase modulated optical have relative phase difference between adjacent pulses. Such difference can be measured by extinction ratio. Taga et al is cited to show such well known concept. In col. 4, lines 28-45, Taga et al teach extinction ratio between optical pulses to be between 3 dB and 10dB. Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide such extinction ratio. One of ordinary skill in the art would have been motivated to do such in order to reduce interchannel crosstalk.

Regarding claim 94, the combination of Liu et al, Satoh and Taga et al discloses transmission of RZ-PSK optical signal comprising of phase modulator to modulate optical pulses which has extinction and differs form the claimed invention in that Liu et al do not specifically disclose an extinction ratio between adjacent pulses of the optical signal that have relative phase difference of at least about $\pi/2$ is at least about 20 dB. However, as discussed above, since the optical signal are phase modulated, therefore it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to provide phase difference between the optical pulses, such as $\pi/2$, and have extinction ratio of at least about 20 dB. One of ordinary skill in the art would have been motivated to do such in order to reduce interchannel crosstalk.

Response to Arguments

12. Applicant's arguments with respect to claims 73-73 and 85-94 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Fuller et al (US Patent No. 6,671,079) is cited to show method and apparatus for transmitting a modulated optical signal.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dalzid Singh whose telephone number is (571) 272-3029. The examiner can normally be reached on Mon-Fri 9am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DS
June 3, 2006
Dalzid Singh